

## **The Business of Innovation: An Interview with Paul Cook**

by Bill Taylor

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Paul M. Cook, founder and CEO of Raychem Corporation, is in the business of supplying technology-intensive products to industrial customers in sectors such as aerospace, automobiles, construction, telecommunications, and utilities. Raychem builds products that connect, seal, and protect signal-carrying cables for telephone networks and cable television systems. It manufactures much of the high-performance wire and cable that runs through military and commercial aircraft. Self-regulating heaters based on conductive polymers ensure the smooth flow of oil through pipelines in harsh environments and deice rails for mass transit systems.

On a more basic level, though, Paul Cook is in the business of innovation. Since its founding in 1957, Raychem has pursued a consistent and ambitious strategy: to master a set of core technologies and create thousands of proprietary products based on those technologies. Today Raychem generates annual revenues of more than \$1 billion through the sale of some 50,000 products. For most of those products, it is the world's leading supplier; for many, it is the only supplier. Its products have found receptive customers around the world. Raychem generates more than 60% of its revenues outside the United States and has extensive manufacturing and research facilities in Western

Europe and Asia. The company has more than 900 U.S. patents with some 300 pending, as well as some 3,000 foreign patents with another 9,000 pending.

Raychem's powerful market position has contributed to outstanding financial performance. It consistently earns gross margins of more than 50%, unrivaled in the industries in which it operates. The company has no net bank borrowings. Its price-earnings multiple of 30 is well above market averages.

Innovation at Raychem goes beyond products. Indeed, the company is in the process of reinventing itself. For its first 25 years, Raychem recorded explosive growth (averaging 25% per year) as it tapped the global potential of its products. Since the early 1980s, as growth slowed, Raychem has worked to develop new core technologies and to position itself in new markets. Its recently developed expertise in thin-film and liquid-crystal displays has created a role for the company in burgeoning markets for computer touchscreens and "switchable windows." A ten-year initiative in fiber optics has made Raychem, through its Raynet subsidiary, a leading contender to bring fiber optics to the home—a vast global market worth billions of dollars.

Mr. Cook, 65, is a graduate of the Massachusetts Institute of Technology and a former head of the Radiation Laboratory at the Stanford Research Institute. He will step down as Raychem's CEO on April 1 but will remain chairman. The interview was conducted in Boston and at Raychem's Menlo Park, California headquarters by HBR associate editor William Taylor.

HBR: What's the secret to being an innovative company?

**Paul Cook:** There is no secret. To be an innovative company, you have to ask for innovation. You assemble a group of talented people who are eager to do new things and put them in an environment where innovation is expected. It's that simple—and that hard. There are, after all, a limited number of things

management can ask for. We get innovation at Raychem because our corporate strategy is premised on it. Without innovation we die.

And I don't mean just from the engineers. Innovation is as much about sales or service or information systems as it is about products. We spend twice as much on selling as we do on research and development, so creativity from our sales force is just as important as creativity from the labs. How do you sell a product no one has seen before? How do you persuade a customer to accept us as a sole source for an important component? There's no one in any organization who can't be clever and imaginative about doing his or her job more effectively. We expect innovation from our secretaries and the people on the loading docks as well as from the scientists.

Still, few American companies are as innovative as they could be—or must be—to survive intense global competition. What's missing?

You won't get innovation without pressure. Most companies put pressure on their sales force to go out and get orders. They put pressure on manufacturing to cut costs, increase yields, improve quality. But they forget the importance of pressure when it comes to new products and processes. We want to grow this company from \$1 billion a year to \$5 billion, and we don't do big acquisitions. The only way to get that kind of growth is to get more and better products out the door faster.

I'm convinced that's a big reason Raychem grew so explosively in the early days. When we started the company, we didn't know what products we were going to make. We knew the first electron-beam machines were coming to market from General Electric, and we knew there were potential industrial applications for the technology. So we bought a machine. And pretty soon we started running out of money. We were under enormous pressure to find successful products—and we did. We came up with lots of good ideas because we had to. People need a fair amount of pressure to have creative ideas.

How do you maintain pressure in a successful global company?

Everyone has heard the cliché, “management by walking around.” Well, you can’t walk around 30 plants in 12 countries, which is what Raychem has right now, without dropping from exhaustion. But you can practice what I refer to as “management by calling about.” Almost every day I use the telephone to contact Raychem people somewhere in the world. “How did your experiment go last night? What results do you have this morning? What are your ideas for a new approach? Why don’t you fax me your product plan?” If you keep the pressure on in a constructive way, if you demonstrate genuine curiosity about what’s happening in the labs, it stimulates people to keep the creative process going.

Why do organizations need such pressure and prodding? Isn’t innovation the most exhilarating part of being in business?

What separates the winners and losers in innovation is who masters the drudgery. The creative process usually starts with a brilliant idea. Next you determine whether, if the brilliant idea worked, it would be worth doing from a business standpoint. That’s the exhilarating part. It may be the most stimulating intellectually, but it’s also the easiest.

Then comes the real work—reducing the idea to practice. That’s the drudgery part of innovation, and that’s where people need the most pressure and encouragement. You can draw a chart of how the original excitement of a new idea creates all kinds of energy, but then people go into the pits for a long time as they try to turn that idea into products that are reproducibly manufacturable. That’s when you use the phone and the fax machine. That’s when you have review meetings between the technical people and senior management. That’s when, as CEO, you show the entire organization that you are just as interested in new product and process development as you are in manufacturing costs, sales, or quality.

We don’t often hear the words “innovation” and “drudgery” together.

Too many people still think innovation is about one brilliant technologist coming up with one breakthrough idea. It’s not. When we started Raychem, we began to learn what radiation

chemistry could do. Within three or four years, we had generated virtually every idea behind the products we're selling today, and we're still working on that original inventory of ideas. Ten years ago, after we began work on conductive polymers, we identified a market for all the manifestations of the technology that totaled \$747 million a year. We made our "747 list" and began working through it. At the time, it was a \$5 or \$10 million business. Today we're up to \$150 million a year. So we still have a long way to go.

Or think about semiconductors. I can make a case that the semiconductor world hasn't had a really new idea for 15 or 20 years. Those companies have essentially been practicing the same technology. They've learned more about it, they've penetrated it throughout the economy, but the core technologies haven't changed that much. The pioneers of the semiconductor industry could recite within the first few years all that could be done with the technology. The winners have been the companies that reduced the technology to practice most quickly.

Does that explain some of our competitive slide against the Japanese?

This is where the Japanese are eating us alive. They're making us look like amateurs in product development. American technologists are still without peer in terms of the imagination they bring to problems. No one can question our technical brilliance. The Japanese don't pioneer the brilliant solutions, but they find the brilliant solutions. Then they bring them over to Japan and master the drudgery to reduce them to practice. Japan may not have the Nobel laureates yet, but I'm not sure it needs them to flourish. And if it wants them, all it has to do is create the right environment and that will happen too.

What's frightening to me is the thoroughness with which the Japanese scan the world for important technologies, learn them, know the patent literature, know the technical literature, and turn over every stone. We've been working on shape-memory alloys for almost 25 years. The Japanese keep knocking on our doors; they want a license from us. They are the only companies in the world besides Raychem that see the potential for this technology. In

fact, whenever we find technologies that we consider powerful, for which we have great expectations, it isn't long before the Japanese show up and say, "How about a license?" or "How about a joint venture?" We seldom get chased by American or European companies.

Can a company teach its people to be innovative?

No. Innovation is an emotional experience. You can train people technically, but you can't teach them curiosity. The desire to innovate comes partly from the genes; you're born with it. It also comes from your early life, your education, the kind of encouragement you got to be creative and original. Innovative people come in all shapes and sizes and in all personality types. Some people are happiest when they're wrestling with a problem; I'm one of those. Others go into a green funk. They're miserable and depressed until they have the answer. But you can't have a good technologist who's not emotionally involved in the work. You can't have a good technologist who doesn't wake up in the middle of the night searching for answers. You can't have a good technologist who doesn't come into the lab eager to see the results of last night's experiment.

So before you hire people, you ask about their childhood?

You bet. One of my most important jobs is finding the right people to add to the Raychem environment—people who genuinely want to serve the customer, who want to build new products that are superior to anything that's come before, who are willing to stick their necks out to do new things. That means learning how their minds work, what they think about, what excites them, how they approach problems.

The top management of this company spends a huge amount of time—I probably spend 20% of my time—recruiting, interviewing, and training. It's not unusual for a technologist candidate to go through ten in-depth interviews. Now some people do better in interviews than others. But by keeping the

evaluation process broad, we usually get broad agreement on candidates. I can't think of anyone who's been a great success at Raychem who wasn't a big success in the interviews.

How do you motivate people over the long haul to keep them focused on innovation?

The most important factor is individual recognition—more important than salaries, bonuses, or promotions. Most people, whether they're engineers, business managers, or machine operators, want to be creative. They want to identify with the success of their profession and their organization. They want to contribute to giving society more comfort, better health, more excitement. And their greatest reward is receiving acknowledgment that they did contribute to making something meaningful happen. So the most important thing we do is build an organization—a culture, if you'll pardon the word—that encourages teamwork, that encourages fun and excitement, that encourages everyone to do things differently and better—and that acknowledges and rewards people who excel.

Of course, people do use financial yardsticks to measure how they're doing. So you have to pay well. We pay our people above average, but only slightly above average—sixtieth percentile or so. Bonuses give them an opportunity to move up a fair amount based on overall corporate results and individual performance. Every person in the company earns a cash bonus each quarter based on after-tax profits as a percentage of sales. Ten percent of our people are in a second bonus pool. The size of a pool reflects the performance of the group or division; the distribution of the pool reflects individual performance.

Some companies spread bonuses quite evenly among group members. We have a different approach. Typically within a division there are significant differentials based on performance. Having a big spread causes some unhappiness. But it also creates drive, because I think people respect how we evaluate their contribution. We don't just reward success; we reward intelligent

effort. We've paid sizable bonuses to people who have worked day and night, with remarkable proficiency, on a year-long project—only to find the market had disappeared.

We must be doing something right, by the way. Our attrition rate is very low, and the number of people who have left to start businesses to compete with us is virtually nil. That's pretty unusual when you consider what happens in the rest of Silicon Valley.

Let's talk about technology. Increasingly, companies are trying to close the innovation gap by working with other companies—often their competitors—in strategic alliances, joint ventures, and research partnerships. Does this worry you?

Yes. No company can do everything, and we use partnerships on a selective basis. We're working with Nippon Sheet Glass on switchable windows and with Furukawa Electric in shape-memory alloys. But those and a few other alliances are the exceptions. I've always believed that truly innovative companies must build an intellectual and technical infrastructure around core technologies. At Raychem, those core technologies are radiation chemistry, conductive polymers, shape-memory alloys, cross-linked gels, liquid-crystal displays, and a few others. Companies need a single-minded commitment to their core technologies, a commitment to knowing more about them than anyone else in the world. No partnership or joint venture can substitute for technology leadership.

You also have to make sure your company has the very brightest people in your core technologies. Some who know the analytical part of the technology, some who know the molecular part, some who know the physics, some who know the chemistry. You make sure those people talk to each other, that there is regular and intensive interchange between all those disciplines. They have to work together, communicate, sweat, swear, and do whatever it takes to extract from the core technology every product possibility. The fax machine has been absolutely magnificent in that regard. Our technologists are using it to share sketches and



plans, annotate them, and feed them back. The fax machine is much more important than videoconferencing as a tool for technical interaction.

Still, effective communication doesn't come easy. One of the problems with people at the cutting edge of their field is that they don't think anyone can teach them anything. That's why we recently started a "Not Invented Here" award at Raychem. We celebrate people who steal ideas from other parts of the company and apply them to their work. We give the person who adopts a new idea a trophy and a certificate that says, "I stole somebody else's idea, and I'm using it." The person on the other side, the person who had the idea, also gets an award. His certificate says, "I had a great idea, and so and so is using it." We hope to give out hundreds of these awards.

How does being committed to core technologies differ from how most companies manage technology?

Too many American companies are only immersed in their markets. They bring along whatever technology they think is necessary to satisfy a market need. Then they fall flat on their faces because the technology they deliver isn't sophisticated enough or because they don't know what alternatives the competition can deliver.

We think about our business differently. Raychem's mission is to creatively interpret our core technologies to serve the marketplace. That means we don't want to be innovators in all technologies. We restrict our charter to the world of material science, and within material science, to niches that can sponsor huge growth over a long period of time and in which we can be pioneers, the first and best in the world. And I mean *the* first. That means we can't just go to universities and find trained people; we have to train them ourselves. We usually can't use technologies from university and government labs, although we stay abreast of what's happening. After all, if we're a pioneer in a technology, how can we go to a university and learn about it?

Then we draw on those core technologies to proliferate thousands of products in which we have a powerful competitive advantage and for which our customers are willing to pay lots of money relative to what it costs us to make them. Think about that. If you can pioneer a technology, use it to make thousands of products, sell those products at high price-to-cost relationships to tens of thousands of customers around the world, none of which individually is that important to you, you wind up with an incredibly strong market position. That philosophy hasn't changed for 33 years. Our challenge has been to apply it to a bigger and bigger organization.

Why don't more companies follow this model?

Because it's a harder way to do business. Most companies say, "Let's pick markets in which we can be big players and move as fast as we can to do the simple things." More companies today want to be dominant players in big markets—you know, number one or number two in the world—or they get out. Jack Welch, General Electric's chairman, has followed that strategy very successfully for years. That's not our strategy at all.

A different, and I think more powerful, way to compete is to avoid competition altogether. The best way to avoid competition is to sell products that rivals can't touch. When we started Raychem, the last thing we wanted to do was make products that giants like GE or Du Pont would also be interested in making. We made sure to select products that would not be of interest to large companies. We selected products that could be customized, that we could make in many varieties—different sizes, different thicknesses, different colors. We wanted products that were more, not less, complicated to design and build. We wanted products with small potential annual revenues compared with the total size of the company, and we wanted lots of them.

After 33 successful years, I still have trouble pushing that vision inside Raychem; people struggle against it all the time. It takes a lot of confidence to believe that you can go out and master a technology, stay ahead of everybody else in the world, capture markets based on that technology, obtain broad patent coverage,

and then end up with a strong gross profit margin in a protected business. People argue that it would be much easier, that we would grow more quickly, if we put less inventive content in our products and went for bigger markets. That's not my idea of a smart way to grow a business.

So innovation is primarily about pushing technology out the door?

Not quite. What we're really talking about is economically disciplined innovation. Sure, you have to know your core technologies better than anyone else. But you also have to know your marketplace better than anyone else. You have to understand your customers' needs. You have to understand whether or not your product is reproducibly manufacturable, which isn't easy when you're pioneering new technologies. You have to understand the competition's ability to respond to your innovation. You have to understand whether the product can generate a gross profit margin big enough to fund the new investments you need to keep pioneering and to allow for some mistakes along the way. For us, that means a gross profit margin of at least 50%. Unless you can figure ways to save your customers lots of money, to be economically important to them, and to beat the hell out of the competition with products for which they have no alternatives, and to do all that cost-effectively enough to earn big margins, you won't have economically successful innovation.

Don't all companies try to understand their markets and their customers?

But how do they do it? They go out and ask customers what they want. That's not nearly enough. I'm not talking about lip service. There are a whole series of questions that we have to answer before launching a new product. Will it save customers a little money or a lot of money? Will it make marginal improvements in the performance or efficiency of the customers' products or will it make major advances? What does it cost customers to use this new product beyond what we charge them? What are their overhead rates? What are the hourly rates for the people doing the installation? I could go on. That's why Raychem probably has

more MBAs per capita than any other technology company in the United States. We have to know our customers' business problems and economics as well as we know our technology.

We also have to ask one last question: Will the customer accept a sole-source relationship with us? After all, we're in the business of delivering pioneering, proprietary products. An oil company can't decide to use one of our couplings for a pipeline in the desert and then bring in two other suppliers for the same product. We're the only supplier in the world. So we have to understand the customer deeply enough—and the customer has to know we understand him—that he has the confidence to establish a sole-source relationship with us for a new and novel product.

So companies aren't just selling innovation, they're selling confidence that they will stand behind the innovation?

Absolutely. Many customers have stuck their necks out to buy products from us that they have never seen before. That means we get into trouble from time to time. But I can't remember one case where this organization didn't rally day and night, as long as it took, to solve the problem. In fact, when you have those experiences, customers always wind up more friendly, more favorably disposed toward the next innovation. That's not the way we intend to do business, but it's part of the territory.

Customer responsiveness and trust can also lead to tremendous business opportunities. Cross-linked gels are now one of our core technologies. That business grew out of a very specific problem we had to solve for a customer. A hurricane hit Corpus Christi, Texas, and knocked out a bunch of telephones. We sent down a task force at the request of Southwestern Bell and discovered that most of the shorting out occurred in certain terminal boxes. At the time we had a tiny research effort in the area of cross-linked gels, and we thought we could use the technology to solve the problem. It worked, even though we didn't understand all the principles behind it. So we plugged gels into research to explore what fundamental technologies were involved. We discovered all kinds

of fascinating things and expanded the research effort. Today we probably have 100 people throughout the company working on gels. It's a profitable, fast-growing business.

How do you develop an in-depth understanding of markets?

You can't understand the market unless you get your technologists to the customer in a deep and sustained way. Your sales force, the traditional link to the customer, only gets you part of the way. It can open doors and find opportunities, but it can't really solve the customer's problems. And you can't pass the details of what the customer needs through the filter of the salesperson. You can't expect salespeople to have the imagination and expertise to know what can be accomplished through manipulating the technology.

We have technologists at Raychem who are superb in the labs. We have salespeople and marketers, most with technical training, who are superb at understanding customer needs. The person who can combine deep knowledge of the technology with deep knowledge of the customer is the rarest person of all—and the most important person in the process of innovation. We don't have very many of those people at Raychem, but those we do have are all technologists. We have never come up with an important product that hasn't been primarily the work of a technologist. That's because doing something truly important in our field requires knowing all the things that have gone before. You have to have the technology in your bones.

It's easier to teach a technologist economics than it is to teach an economist technology. And our technologists enjoy learning about the business. Whenever they go out to visit customers, they absolutely love it. It stimulates them. It excites them. It teaches them all kinds of things they wouldn't know if they stayed in the labs. It's a very important part of the innovation process here. That doesn't mean we do enough of it; nobody does.

What are the biggest obstacles to innovation?

For an organization to remain innovative, it has to be willing—even eager—to “obsolete” itself as fast as it can. So one of the biggest obstacles to successful innovation is success itself. All too often a company will develop an important new product and spend years asking itself the same questions—how can we make it a little better, a little cheaper, a little more sophisticated? Those are all important questions; there’s always room for incremental improvement. But you can’t let the entire innovative thrust revolve around making products faster, better, cheaper. A truly innovative company never stops asking more fundamental questions about its most successful products. Are there whole new ways to solve the problem—ways that might cut costs in half or double or triple performance?

So Raychem is working to “obsolete” its own products?

Every day. Right now we are in the process of “obsoleting” one of our best products, a system for sealing splices in telephone cables. That product generates \$125 million of revenue per year, more than 10% of our total sales. We introduced the original splice closure, which was based on our heat-shrinkable technology, about 20 years ago. It absolutely took over the market. Our customers, the operating telephone companies of the world, have been thrilled with it. We also do pretty well on it financially—gross profits are well above average.

Now we could have kept on improving that product for years to come. Instead, we’ve developed a radically new splice-closure technology that improves performance tremendously, and we’re working very hard to cannibalize the earlier generation. We introduced this new technology, which we call SuperSleeve, in the last few years. Today we’re about halfway through the conversion process; 50% of our splice-closure revenues this year will be from the new technology, 50% from the old. By the end of next year, we want virtually 100% of these revenues to be from the SuperSleeve technology. In fact, we recently closed our only U.S. manufacturing line for the old technology.

How’s that different from what any good company does—once an old product runs out of steam, you introduce a new product?

That's precisely my point—our old product *wasn't* running out of steam. Our customers had virtually no complaints about it. But because we knew the product and its applications even better than our customers did, we were able to upgrade its performance significantly by using a new technology. Our margins on the new technology, at least until we get manufacturing costs down, are lower than our margins on the old product. We had to do an aggressive selling job and take a short-term financial hit—to persuade customers to adopt the new product.

Why are we doing it? Because we understand that if we don't "obsolete" ourselves, the world will become more competitive. We'd spend most of our time and energy reducing costs and outmaneuvering the competition that springs up. And for all that, we'd wind up with products that are only incrementally better, not fundamentally better.

Remember, we want products for which there is no competition. Even if we could have maintained our margins on the old product—and we probably could have by reducing manufacturing costs to keep pace with declining prices—we don't want to play that game. So today we're capable of delivering a demonstrably better product at the same price. And we're trying to persuade our telecommunications customers to write new specifications that require performance as good as what SuperSleeve can deliver. That's the game we want to play. And it's one of the hardest games any organization can play.

Are there other obstacles?

Size is the enemy of innovation. You can't get effective innovation in environments of more than a few hundred people. That's why as we continue to grow, we want Raychem to feel and function less like a giant corporation than a collection of small groups, each of which has its own technical people, marketing people, engineering people, manufacturing people. Sure we want to get big. But we must stay innovative.

Innovation happens in pockets, and the location of those pockets changes over time. So we play musical chairs with people and make extensive use of skunk works and project teams. Using small groups also allows us to make sure that a technologist is at the head of the group making the decisions. I prefer to put development decisions on the backs of technologists rather than on businesspeople. I don't want our new product teams automatically going after the biggest markets. I want them going after the best way to develop the technology along proprietary lines so long as growing and profitable markets exist. Once the product succeeds and your problems become cost, quality, and efficiency, then you can think about putting different managers in charge.

I'm surprised you haven't mentioned money as an obstacle.

Innovation takes patient capital. American companies just aren't spending enough on R&D. If companies increased their R&D spending by 2% of sales, and therefore lowered profits by 2% of sales, they'd be much better off in the long run—and so would the United States. Normally, we spend 6% or 7% of sales on R&D. This year we'll spend more than 11% of sales on R&D, even though revenues are flat and margins down a bit, because we're working on several technologies that are going to materialize into really good businesses. That's an extraordinary commitment for us to make during a disappointing period, but it's the kind of commitment more companies are going to have to start making.

Let me give you a specific example. About 25 years ago, we learned that the Naval Ordnance Laboratories were experimenting with metals that shrunk with incredibly high force when heated. We were in heat-shrinkable plastics, so we thought this was something we should know about. We started some research. We developed a metal coupling to join hydraulic lines for the F-14 fighter, and the Navy bought it in the second year we had the technology. So we continued the research and made major investments. We kept pushing to get manufacturing costs down. We searched for markets in which these shape-memory alloys could have explosive growth.



Last year, for the first time, we made money on that technology. We stayed with it for more than two decades. We are without question the world's pioneer. We have patents coming out of our ears. After 25 years, shape-memory alloys are on the verge of becoming a big and profitable business. And believe me, we are going to stick with that technology.

But you know the corporate lament: Wall Street won't let us make the investments we know we have to make to stay competitive.

Wall Street does apply pressure; Raychem's market value dropped by 10% in one day last year when we reported disappointing quarterly results. But the analysts aren't totally unreasonable. Our fiber-optics subsidiary, which is one of the most exciting new ventures in the company, is a good example. We started exploring the fiber-optics area more than ten years ago. After we worked with the technology for a few years and made some technical discoveries, we began to see what was possible. We concluded it would take several hundred million dollars to bring the technology to market and make it profitable. So far it's taken \$150 million to get Raynet on its feet, and we haven't made the first sale yet. (See the insert "Innovation at Raychem: The Raynet Story.")

**Innovation at Raychem: The Raynet Story**  
**by: William Taylor**

Early this year, in neighborhoods outside Boston, Massachusetts and Cologne, West Germany, Raynet ...



Wall Street was shocked when we told the analysts about Raynet. We had been secretly working on the technology for years so the competition couldn't find out. Wall Street is still nervous. But the more it learns about our system and the potential markets, the

more comfortable it gets. We've also tried to be smart about the financing. We brought in BellSouth as a partner to share some of the costs. And we break out Raynet's financials so the analysts can evaluate our existing businesses on a stand-alone basis.

Sure, it takes some courage to tell Wall Street, "Dammit, I'm going to spend a couple more percentage points of revenues on R&D and let my profits go down. But I'm going to show you how over a period of time that investment is going to pay off." That's not an easy story to sell. But it is sellable—especially if you have a track record of effective technology innovation.

Based on our conversation, we might identify the following principles of innovation: necessity is the mother of invention. Invention is 1% inspiration and 99% perspiration. Possession is nine-tenths of the law. Is the secret to innovation rediscovering old truths we somehow forgot?

Not quite. There are at least three new forces today. First, intellectual property is absolutely key. We are always driving for an ironclad proprietary position in all our products around the world. The ability of companies from other countries to copy important developments has increased so much that there's no way for this society, with our high standard of living, to compete against societies with lower standards of living unless we have protected, proprietary positions. So we make aggressive use of intellectual property laws and work as hard as we can to get the rest of the world to adopt effective protections.

Second, technology is becoming more complex and interdependent. To practice pioneering innovation, you must develop a critical mass of many different skills. If you're a small company, you better restrict yourself to one core technology in which you can do this. If you're a big company, you better take advantage of your technology scale and scope. You can't make that assumption anymore. You have to use your leadership position to push the frontiers of the technology, or you won't be a leader for long.

What's the third difference?

Innovation is a global game—both on the supply side and on the demand side. Raychem's most innovative lab is our telecommunications lab in Belgium. It's a relatively small facility, but it's a melting pot of scientists and engineers from Belgium, America, England, France, and Germany. I can predict with a good deal of accuracy how a technologist brought up in the Flemish region of Belgium will approach a particular problem. I can tell you how a French engineer might approach that same problem. You have to create an organization that can mix and match all of its skills around the globe.

On the demand side, you can't leave a technology window open in another geographical marketplace. You have to fight foreign competition before it starts. Twenty years ago, MITI [Japan's Ministry of International Trade and Industry] targeted radiation chemistry as one of its industries of the future. MITI supported a lab in Osaka and tried to get the technology off the ground. Today there are 30 Japanese companies with radiation-processing technology, but together they probably have only 20% of our business. Why? Because we took the threat seriously; we refused to license our technology. We also built a business in Japan so that Japanese companies couldn't get a safe haven in which to charge high prices, grow their businesses, and then give us trouble around the world. If you want to lead with a new technology, you have to lead everywhere.

Can any company be innovative?

Every company *is* innovative or else it isn't successful. It's just a question of degree. The essence of innovation is discovering what your organization is uniquely good at—what special capabilities you possess—and taking advantage of those capabilities to build products or deliver services that are better than anyone else's. Every company has unique strengths. Success comes from leveraging those strengths in the market.

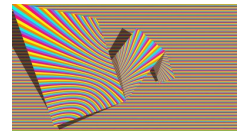
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